

**Docket: RANALLI-3**

**METHOD AND APPARATUS FOR REALIZING AN OPTICAL FILTER  
WITH AN ARBITRARY NARROW-BAND IMPULSE RESPONSE**

**ABSTRACT OF THE DISCLOSURE**

[0001] A filter synthesis technique for realizing an arbitrary (amplitude- and phase-specified) transfer function for narrow-band incident optical signals, using a quasi-periodic echelle structure. In an ordinary (periodic) diffraction grating, the fixed spacing of its rulings is chosen in order that the device exhibit a very narrow spectral peak at a particular center wavelength, for a given angle of incidence, when the output is observed at the appropriate diffraction angle. In accordance with the present invention, the basic periodic structure is spatially perturbed in both the center spacing and width of its rulings in such a manner as to spread the spectral peak into an arbitrary spectral shape in the vicinity of what was (in the original, unperturbed grating) a narrow peak. In addition, the phase transfer function over the spectral range of interest may be tailored to fit any desired spectral phase profile.